

CLAIMS

1. A shift control system (10) switching a shift range via an actuator (42), comprising:

5 shift means (100) driven by said actuator (42) for switching the shift range;
restriction means (110) for restricting rotation in a predetermined direction of said actuator (42) in a predetermined shift range;
rotation control means (40) for rotating said actuator (42);
count means (46) for obtaining a count value according to a rotational amount of
10 said actuator (42); and

position setting means (40) for setting, when said actuator (42) is rotated by said rotation control means (40) in the direction in which rotation of said actuator (42) is restricted by said restriction means (110), a reference position of said actuator (42) corresponding to the predetermined shift range based on a state of said count value
15 obtained by said count means (46).

2. The shift control system (10) according to claim 1, wherein
said position setting means (40) includes reference position setting means for setting the reference position of said actuator (42) by detecting that said count value
20 obtained by said count means (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

3. The shift control system (10) according to claim 2, wherein
said position setting means (40) includes reference position setting means for
25 setting a reference position of said actuator (42) corresponding to another shift range different from said predetermined shift range, based on a rotatable amount of said actuator (42) between said predetermined shift range and said another shift range.

4. The shift control system (10) according to claim 2, wherein
said position setting means (40) includes reference position setting means for
setting, when said shift means (100) switches the predetermined shift range to another
shift range, a reference position of said actuator (42) corresponding to said another shift
5 range.

5. The shift control system (10) according to claim 4, wherein
said position setting means (40) includes detection means for detecting a
rotatable amount of said actuator (42) based on the reference position corresponding to
10 the predetermined shift range and the reference position corresponding to the another
shift range.

6. The shift control system (10) according to claim 2, wherein
said position setting means (40) includes reference position setting means for
15 setting a reference position of said actuator (42) corresponding to another shift range at
a predetermined timing in order to correct a secular change of said shift means (100) or
said restriction means (110).

7. The shift control system (10) according to claim 6, wherein
20 said position setting means (40) includes detection means for detecting a
rotatable amount of said actuator (42) based on the reference position corresponding to
the predetermined shift range and the reference position corresponding to the another
shift range.

8. The shift control system (10) according to claim 1, wherein
25 said position setting means (40) includes reference position setting means for
setting a reference position of said actuator (42) corresponding to another shift range
different from said predetermined shift range, based on a rotatable amount of said

actuator (42) between said predetermined shift range and said another shift range.

9. The shift control system (10) according to claim 1, wherein
said position setting means (40) includes reference position setting means for
5 setting, when said shift means (100) switches the predetermined shift range to another
shift range, a reference position of said actuator (42) corresponding to said another shift
range.

10. The shift control system (10) according to claim 9, wherein
10 said position setting means (40) includes detection means for detecting a
rotatable amount of said actuator (42) based on the reference position corresponding to
the predetermined shift range and the reference position corresponding to the another
shift range.

15 11. The shift control system (10) according to claim 1, wherein
said position setting means (40) includes reference position setting means for
setting a reference position of said actuator (42) corresponding to another shift range at
a predetermined timing in order to correct a secular change of said shift means (100) or
said restriction means (110).

20 12. The shift control system (10) according to claim 11, wherein
said position setting means (40) includes detection means for detecting a
rotatable amount of said actuator (42) based on the reference position corresponding to
the predetermined shift range and the reference position corresponding to the another
25 shift range.

13. The shift control system (10) according to any of claims 1-12, wherein
said rotation control means (40) includes means for making smaller an output

per unit time of said actuator (42) driven for setting the reference position of said actuator (42) than an output per unit time of said actuator (42) driven for switching the shift range.

- 5 14. The shift control system (10) according to any of claims 1-12, wherein said position setting means (40) includes setting means for setting, based on said reference position, a target rotational position, to be attained when the shift range is switched, of said actuator (42) in the shift range with said reference position being set.
- 10 15. The shift control system (10) according to claim 14, wherein said rotation control means (40) includes adjustment means for adjusting, when the shift range is switched, the rotational amount of said actuator (42) to allow said actuator (42) to attain said target rotational position by rotating said actuator (42) to drive said shift means (100).
- 15 16. A shift control system (10) switching a shift range via an actuator (42), comprising:
a shift component (100) driven by said actuator (42) for switching the shift range;
20 a restriction component (110) for restricting rotation in a predetermined direction of said actuator (42) in a predetermined shift range;
a rotation control unit (40) for rotating said actuator (42);
a count unit (46) for obtaining a count value according to a rotational amount of said actuator (42); and
25 a position setting unit (40) for setting, when said actuator (42) is rotated by said rotation control unit (40) in the direction in which rotation of said actuator (42) is restricted by said restriction unit (110), a reference position of said actuator (42) corresponding to the predetermined shift range based on a state of said count value

obtained by said count unit (46).

17. The shift control system (10) according to claim 16, wherein
said position setting unit (40) sets the reference position of said actuator (42) by
5 detecting that said count value obtained by said count unit (46) is in a state where a
minimum value or a maximum value of said count value is constant for a predetermined
period of time.

18. The shift control system (10) according to claim 17, wherein
10 said position setting unit (40) sets a reference position of said actuator (42)
corresponding to another shift range different from said predetermined shift range, based
on a rotatable amount of said actuator (42) between said predetermined shift range and
said another shift range.

19. The shift control system (10) according to claim 17, wherein
15 said position setting unit (40) sets, when said shift component (100) switches the
predetermined shift range to another shift range, a reference position of said actuator
(42) corresponding to said another shift range.

20. The shift control system (10) according to claim 19, wherein
20 said position setting unit (40) detects a rotatable amount of said actuator (42)
based on the reference position corresponding to the predetermined shift range and the
reference position corresponding to the another shift range.

21. The shift control system (10) according to claim 17, wherein
25 said position setting unit (40) sets a reference position of said actuator (42)
corresponding to another shift range at a predetermined timing in order to correct a
secular change of said shift component (100) or said restriction component (110).

22. The shift control system (10) according to claim 21, wherein
said position setting unit (40) detects a rotatable amount of said actuator (42)
based on the reference position corresponding to the predetermined shift range and the
5 reference position corresponding to the another shift range.

23. The shift control system (10) according to claim 16, wherein
said position setting unit (40) sets a reference position of said actuator (42)
corresponding to another shift range different from said predetermined shift range, based
10 on a rotatable amount of said actuator (42) between said predetermined shift range and
said another shift range.

24. The shift control system (10) according to claim 16, wherein
said position setting unit (40) sets, when said shift component (100) switches the
15 predetermined shift range to another shift range, a reference position of said actuator
(42) corresponding to said another shift range.

25. The shift control system (10) according to claim 24, wherein
said position setting unit (40) detects a rotatable amount of said actuator (42)
20 based on the reference position corresponding to the predetermined shift range and the
reference position corresponding to the another shift range.

26. The shift control system (10) according to claim 16, wherein
said position setting unit (40) sets a reference position of said actuator (42)
25 corresponding to another shift range at a predetermined timing in order to correct a
secular change of said shift component (100) or said restriction component (110).

27. The shift control system (10) according to claim 26, wherein

said position setting unit (40) detects a rotatable amount of said actuator (42) based on the reference position corresponding to the predetermined shift range and the reference position corresponding to the another shift range.

5 28. The shift control system (10) according to any of claims 16-27, wherein said rotation control unit (40) makes smaller an output per unit time of said actuator (42) driven for setting the reference position of said actuator (42) than an output per unit time of said actuator (42) driven for switching the shift range.

10 29. The shift control system (10) according to any of claims 16-27, wherein said position setting unit (40) sets, based on said reference position, a target rotational position, to be attained when the shift range is switched, of said actuator (42) in the shift range with said reference position being set.

15 30. The shift control system (10) according to claim 29, wherein said rotation control unit (40) adjusts, when the shift range is switched, the rotational amount of said actuator (42) to allow said actuator (42) to attain said target rotational position by rotating said actuator (42) to drive said shift component (100).

20 31. A shift control method for switching a shift range via an actuator (42), comprising the steps of:
rotating by said actuator (42) shift means (100) for switching the shift range;
stopping rotation of said actuator (42) by restriction means (110) for restricting
rotation in a predetermined direction of said actuator (42) in a predetermined shift
25 range;

detecting a reference position corresponding to the predetermined shift range based on a position where said stopping is effected; and

determining, based on said reference position, a target rotational position when

the shift range is switched by said actuator (42).

32. A shift control method for switching a shift range via an actuator (42), comprising the steps of:

5 rotating by said actuator (42) a shift component (100) for switching the shift range;

stopping rotation of said actuator (42) by a restriction component (110) for restricting rotation in a predetermined direction of said actuator (42) in a predetermined shift range;

10 detecting a reference position corresponding to the predetermined shift range based on a position where said stopping is effected; and

determining, based on said reference position, a target rotational position when the shift range is switched by said actuator (42).

15 33. A shift range switching device of an automatic transmission mounted on a vehicle, comprising:

shift means (100) for switching a shift position to one of a plurality of shift positions by rotating an actuator (42);

20 storage means for storing said one of shift positions resulting from switching by said shift means (100);

first restriction means for restricting rotation in a predetermined direction of said actuator (42) for a first shift position among said plurality of shift positions; and

control means (40) for controlling rotation of said actuator (42),

said control means (40) including

25 first position setting means for setting, as a first reference position in said first shift position, a position where the rotation of said actuator (42) is stopped by said first restriction means,

electric power supply control means for permitting shut-off of electric power

supply to said shift range switching device for said first shift position, and
reference position re-setting means for setting again said first reference position
by said first position setting means, when electric power supply is resumed after said
shut-off of electric power supply, on the condition that said shift position stored in said
5 storage means is unknown.

34. The shift range switching device of an automatic transmission according to
claim 33, further comprising second restriction means for restricting rotation of said
actuator (42) in a direction different from said predetermined direction for a second shift
10 position among said plurality of shift positions, wherein

said control means (40) further includes

second position setting means for setting, as a second reference position in said
second shift position, a position where the rotation of said actuator (42) is stopped by
said second restriction means, according to re-setting of said first reference position by
15 said reference position re-setting means, and

movable range calculation means for calculating a movable range of said
actuator (42) based on said first reference position re-set by said reference position re-
setting means and said second reference position set by said second position setting
means.

35. The shift range switching device of an automatic transmission according to
claim 34, further comprising count means (46) for obtaining a count value according to
a rotational amount of said actuator (42), wherein

said position setting means includes reference position setting means for setting
25 said reference position of said actuator (42) by detecting that said count value obtained
by said count means (46) is in a state where a minimum value or a maximum value of
said count value is constant for a predetermined period of time.

36. The shift range switching device of an automatic transmission according to claim 34, wherein

said first restriction means includes means for restricting the rotation of said actuator (42) in said predetermined direction in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110), and

said second restriction means includes means for restricting the rotation of said actuator (42) in the direction different from said predetermined direction in a manner that the rotation of said actuator (42) is restricted in a direction of pulling said detent spring (110).

37. The shift range switching device of an automatic transmission according to claim 33, wherein

said control means (40) further includes determination means for determining a first target rotational position to be attained when the shift position is switched by said actuator (42) to said first shift position, based on said first reference position re-set by said reference position re-setting means.

38. The shift range switching device of an automatic transmission according to claim 37, further comprising second restriction means for restricting rotation of said actuator (42) in a direction different from said predetermined direction for a second shift position among said plurality of shift positions, wherein

said control means (40) further includes

second position setting means for setting, as a second reference position in said second shift position, a position where the rotation of said actuator (42) is stopped by said second restriction means, according to re-setting of said first reference position by said reference position re-setting means, and

determination means for determining a second target rotational position to be attained when the shift position is switched by said actuator (42) to said second shift

position, based on said second reference position.

39. The shift range switching device of an automatic transmission according to claim 38, further comprising count means (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

said position setting means includes reference position setting means for setting said reference position of said actuator (42) by detecting that said count value obtained by said count means (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

40. The shift range switching device of an automatic transmission according to claim 38, wherein

said first restriction means includes means for restricting the rotation of said actuator (42) in said predetermined direction in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110), and

said second restriction means includes means for restricting the rotation of said actuator (42) in the direction different from said predetermined direction in a manner that the rotation of said actuator (42) is restricted in a direction of pulling said detent spring (110).

41. The shift range switching device of an automatic transmission according to claim 37, further comprising count means (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

said position setting means includes reference position setting means for setting said reference position of said actuator (42) by detecting that said count value obtained by said count means (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

42. The shift range switching device of an automatic transmission according to claim 37, wherein

said first restriction means includes restriction means for restricting the rotation of said actuator (42) in said predetermined direction in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110).

43. The shift range switching device of an automatic transmission according to claim 33, further comprising count means (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

said position setting means includes reference position setting means for setting said reference position of said actuator (42) by detecting that said count value obtained by said count means (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

44. The shift range switching device of an automatic transmission according to claim 33, wherein

said first restriction means includes restriction means for restricting the rotation of said actuator (42) in said predetermined direction in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110).

45. The shift range switching device of an automatic transmission according to any of claims 33-44, wherein

said first shift position is a P position allowing a parking mechanism to operate by driving said actuator (42), and

said second shift position is a non-P position inhibiting said parking mechanism from operating.

46. A shift range switching device of an automatic transmission mounted on a

vehicle, comprising:

a shift component (100) for switching a shift position to one of a plurality of shift positions by rotating an actuator (42);

5 a storage unit for storing said one of shift positions resulting from switching by said shift component (100);

a first restriction component for restricting rotation in a predetermined direction of said actuator (42) in a first shift position among said plurality of shift positions; and

a control unit (40) for controlling rotation of said actuator (42),

said control unit (40) including

10 a first position setting unit for setting, as a first reference position of said first shift position, a position where the rotation of said actuator (42) is stopped by said first restriction component,

an electric power supply control unit for permitting shut-off of electric power supply to said shift range switching device for said first shift position, and

15 a reference position re-setting unit for setting again said first reference position by said first position setting unit, when electric power supply is resumed after said shut-off of electric power supply, on the condition that said shift position stored in said storage unit is unknown.

20 47. The shift range switching device of an automatic transmission according to claim 46, further comprising a second restriction component for restricting rotation of said actuator (42) in a direction different from said predetermined direction in a second shift position among said plurality of shift positions, wherein

said control unit (40) further includes

25 a second position setting unit for setting, as a second reference position of said second shift position, a position where the rotation of said actuator (42) is stopped by said second restriction component, according to re-setting of said first reference position by said reference position re-setting unit, and

a movable range calculation unit for calculating a movable range of said actuator (42) based on said first reference position re-set by said reference position re-setting unit and said second reference position set by said second position setting unit.

5 48. The shift range switching device of an automatic transmission according to claim 47, further comprising a count unit (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

 said position setting unit sets said reference position of said actuator (42) by detecting that said count value obtained by said count unit (46) is in a state where a
10 minimum value or a maximum value of said count value is constant for a predetermined period of time.

 49. The shift range switching device of an automatic transmission according to claim 47, wherein

15 said first restriction component restricts the rotation of said actuator (42) in said predetermined direction in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110), and

 said second restriction component restricts the rotation of said actuator (42) in the direction different from said predetermined direction in a manner that the rotation of
20 said actuator (42) is restricted in a direction of pulling said detent spring (110).

 50. The shift range switching device of an automatic transmission according to claim 46, wherein

 said control unit (40) further includes a setting unit for determining a first target
25 rotational position to be attained when the shift position is switched by said actuator (42) to said first shift position, based on said first reference position re-set by said reference position re-setting unit.

51. The shift range switching device of an automatic transmission according to claim 50, further comprising a second restriction component for restricting rotation of said actuator (42) in a direction different from said predetermined direction in a second shift position among said plurality of shift positions, wherein

5 said control unit (40) further includes
a second position setting unit for setting, as a second reference position of said second shift position, a position where the rotation of said actuator (42) is stopped by said second restriction component, according to re-setting of said first reference position by said reference position re-setting unit, and

10 a setting unit for determining a second target rotational position to be attained when the shift position is switched by said actuator (42) to said second shift position, based on said second reference position.

52. The shift range switching device of an automatic transmission according to claim 51, further comprising a count unit (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

15 said position setting unit sets said reference position of said actuator (42) by detecting that said count value obtained by said count unit (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined
20 period of time.

53. The shift range switching device of an automatic transmission according to claim 51, wherein

25 said first restriction component restricts the rotation of said actuator (42) in said predetermined direction in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110), and

 said second restriction component restricts the rotation of said actuator (42) in the direction different from said predetermined direction in a manner that the rotation of

said actuator (42) is restricted in a direction of pulling said detent spring (110).

54. The shift range switching device of an automatic transmission according to claim 50, further comprising a count unit (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

said position setting unit sets said reference position of said actuator (42) by detecting that said count value obtained by said count unit (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

55. The shift range switching device of an automatic transmission according to claim 50, wherein

said first restriction component restricts the rotation of said actuator (42) in said predetermined direction in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110).

56. The shift range switching device of an automatic transmission according to claim 46, further comprising a count unit (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

said position setting unit sets said reference position of said actuator (42) by detecting that said count value obtained by said count unit (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

57. The shift range switching device of an automatic transmission according to claim 46, wherein

said first restriction component restricts the rotation of said actuator (42) in said predetermined direction in a manner that the rotation of said actuator (42) is restricted in

a direction of contracting a detent spring (110).

58. The shift range switching device of an automatic transmission according to any of claims 46-57, wherein

5 said first shift position is a P position allowing a parking mechanism to operate by driving said actuator (42), and

 said second shift position is a non-P position inhibiting said parking mechanism from operating.